POTENTIAL IMPACTS TO MARINE BIRDS AND TURTLES DURING CABLE-LAYING ACTIVITIES FOR THE MARS PROJECT (MBARI) OFF MONTEREY BAY, CALIFORNIA

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INTRODUCTION

The placement of fiber-optic cables on the sea floor in the nearshore environment (e.g. within 50 km of shore) has the possibility of disturbing seabirds and turtles via the presence of vessels and noise during cable-laying or the possibility of harming individuals via entanglement with the cable or collisions with the vessels. This report provides a review of local seabird and turtle species and an independent assessment of the potential impacts to these species from the proposed cable-laying activities by the Monterey Bay Aquarium Research Institute (MBARI), and contains recommendations for procedural changes to minimize effects on seabirds and turtles during cable-laying activities.

The waters within Monterey Bay support an incredible abundance and diversity of marine life, including 90 seabird and 3 sea turtle species (Table 1; Ainley and Terrill 1996). Strong upwelling events and subsequent primary production along with the central location of Monterey Bay between arctic and tropical habitats and the variety of habitats and prey available attract large amounts of marine vertebrates. Some species of seabirds use Monterey Bay as a foraging area during winter (e.g. surf scoters), some migrate to Monterey Bay in the summer and fall to take advantage of the high productivity (e.g. sooty shearwaters), and some reside in the area year round (e.g. Brandt's cormorants). Sea turtles are typically seen during summer and fall, corresponding to warmer sea surface temperatures and increased prey abundance. Because most of the cable-laying operations will occur in the marine environment of Monterey Bay, estuarine and terrestrial species of vertebrates (salamanders, gobies), birds (rails), and plants (gilia, lupine) are excluded from this report. It is not expected that any of the species occupying these habitats will be impacted by MBARI cable operations in Monterey Bay.

To understand the potential impacts of cable-laying on seabird and sea turtle populations in Monterey Bay, a summary of distribution patterns and examples of common species are listed along with a review of potential interactions.

SEABIRDS

Monterey Bay has been identified as an area of biological importance for seabirds, primarily because of the strong upwelling and subsequent primary production (Ainley 1976, Briggs et al. 1987, Benson 2002). The unique bathymetry of Monterey Bay includes a deep submarine canyon that bisects the continental shelf and attracts species to

the shallow, nearshore habitat, the productive shelf-edge habitat, and the deep water habitat, all within a few kilometers of shore (Ainley and Terrill 1996).

Some seabird species are resident to the area, whereas others either spend winter in the area or migrate to Monterey Bay to feed on the abundance of prey present during certain times of the year. Nearly one half of the seabirds nesting in California and millions more seasonal migrants are observed in Monterey Bay at various times of the year (Briggs et al. 1987). Mean densities of birds in Monterey Bay are approximately 172.5 birds/km^2 and average approximately 20.5 species/month (Mason 1997). Greatest numbers of seabirds are observed nearshore in mid-fall and early spring, when there is an overlap between wintering birds and the arrival or departure of migratory species (Benson 2002, Henkel 2003). The strong upwelling events in early spring, combined with the unique bathymetry of Monterey Bay provide excellent habitat for seabirds (Ainley and Terrill 1996).

Seabirds commonly observed in Monterey Bay are listed in Table 1 and for this report have been divided into three groups – resident, wintering, and migratory. The same cable-path groupings used for marine mammals are applied for sea birds: S-1, S-2, and S-3 (Table 1, Figure 1). A description of each group, as well as common examples of each group are provided. Please refer to Table 1 for a more complete description of seabird species and local occurrences.

Resident seabirds

Resident seabirds are defined here as those species that breed within Monterey Bay, as well as those that breed in the areas surrounding Monterey Bay, and are present throughout the majority of the seasons. Commonly occurring resident seabirds include the Western gull, Caspian tern, pigeon guillemot, marbled murrelet, common murre, Brandt's cormorant and pelagic cormorant (Baltz and Morejohn 1977, Ainley and Hunt 1991, Roberson 2002). The Brandt's cormorant breeds on piers, rocks and other structures and is commonly seen throughout Monterey Bay (within 50 km). The Western gull also breeds coastally on cliffs, islets and rooftops and is one of the most common and conspicuous species in Monterey Bay (Roberson 2002). Common murres breed on islands to the north and south of Monterey Bay, and are observed offshore year round (Mason 1997).

Wintering birds

A number of seabirds migrate to Monterey Bay in the early fall and remain through the winter, using Monterey Bay as a rest stop and foraging area. Common species include surf scoters, Western/Clark's grebes, brown pelicans, and common loons. Most of these species are more abundant in the nearshore waters of the Bay (within 5 km), and commonly feed in shallow nearshore waters, either plunge or pursuit diving for prey (Henkel 2003).

Migratory seabirds

Many species of seabirds migrate to Monterey Bay in the late summer and early fall to take advantage of the high productivity in the region. Some species, such as the sooty

shearwater, occur in incredibly large numbers in late summer and make up the majority of the birds encountered in Monterey Bay (Briggs et al. 1987, Ainley and Terrill 1996). Common migratory species include the shearwaters, storm-petrels, black-footed albatross, red and red-necked phalaropes, northern fulmars, Heermann's gulls, and rhinoceros auklets. Typically these birds arrive and remain in Monterey Bay for a couple of months, then make the large migration back to their breeding areas in late fall and winter.

SEA TURTLES

Only three species of sea turtles are observed in Monterey Bay, and only the Leatherback sea turtle is observed in significant numbers (Table 1, Figure 1). Occurrences of Leatherback, Olive ridley, and Green sea turtles have been documented via fishing vessel surveys and beachcast records (Starbird et al. 1993, Moss Landing Marine Labs [MLML] Stranding Network unpub. data), and more recently by aerial surveys in Monterey Bay and along California's coast (S. Benson pers. comm.). During 1986-1991, five live sightings of Olive ridley and Green sea turtles were reported, and between 1993 and 2004, five Olive ridleys and four Green sea turtles were found dead on beaches in the area (Starbird et al. 1993, MLML Stranding Network unpub. data). Typically the Olive ridley and Green sea turtles observed in the area are displaced from warmer waters in southern California, and are "cold-shocked", or lethargic because of the colder water temperatures (Starbird et al. 1993). The Leatherback sea turtle, however, is more accustomed to the cold water in Monterey Bay, and migrates here annually to feed on scyphomedusae that aggregate along upwelling fronts in late summer and fall (S. Benson pers. comm.). During 1986-1991, 96 Leatherback turtles were sighted by fishing vessels, and 12 were found stranded (Starbird et al. 1993). During 1993-2004, 20 Leatherbacks were reported stranded on Monterey County beaches to the MLML Stranding Network.

All sea turtles breed in tropical areas, and thus species observed in Monterey Bay are either migratory (Leatherback) or vagrant (Green and Olive ridley). Of the 19 Leatherback sea turtles that have been tagged and tracked in Monterey Bay, most remained in the bay a couple of days before moving further west, however some turtles may remain in the bay for weeks at a time (S. Benson pers. comm.). Research is continuing on Leatherback sea turtle distribution and abundance in Monterey Bay.

POTENTIAL IMPACTS

Seabirds

Diving seabirds such as common murres are subject to bycatch in various fisheries, especially the gillnet fisheries in Monterey Bay (Melvin and Parrish 2001, Forney et al. 2002). There is potential for entanglement with the cable as it is being laid, but this is probably negligible. Potentially entangling monofilament lines and nets (if any are used) should be periodically checked for entangled animals (every 1-2 hours). Some seabirds are attracted to lights at night, including the storm petrels and Cassin's auklet, and will fly into boats after becoming confused by external lighting or foggy conditions (Weise et al. 2001, E. Phillips pers. obs.). If birds do fly into and hit lights, injury or death is likely (Reed et al. 1985). If cable-laying activities are conducted solely during daylight hours

the risk of seabird collisions with the vessel likely will be minimized. By reducing the amount of external lighting at night, and shielding lights downwards, collisions can be drastically minimized (Reed et al. 1985). Seabirds are also attracted to vessels dumping waste at sea; an effort should be made to minimize dumping while cable-laying operations are occurring. The presence of the cable-laying vessel, as well as the increased sound created by the vessel, has the potential to disturb birds away from the vessel and affect foraging efforts, but is probably not significant. Birds roosting on the surface or foraging near the vessels could be disturbed. The likely consequence would be that the birds would fly away from the vessel or dive in response to the presence of the vessel. Any sort of oil spill can be harmful to diving birds and nearshore species (e.g. snowy plovers), and an oil spill contingency plan should be established. Any oil spills (>42 gallons) from the vessel should be reported to the Office of Emergency Services.

Some of the species listed here are protected under the Federal Endangered Species Act, including the California brown pelican, marbled murrelet (Threatened), short-tailed albatross, and California least tern. Additionally, others species are listed by the state of California as "Special Concern Species"; see Table 1. Because the cable will pass through the beach area in an existing pipe, there should be no disturbance to snowy plovers or other shorebirds on the beaches. Brown pelicans could be disturbed as they rest on the water but the maintaining a slow vessel speed (3-5 knots) will allow ample time for pelicans and other birds to vacate the area before any potential collisions.

Sea turtles

Sea turtles have a long history of incidental catch in fisheries as well as entanglement in abandoned fishing gear including gill nets, longlines, and lobster/crab gear (NRC 1990, Eckert et al. 1999). Often, when entangled in abandoned gear with attached buoys, turtles cannot submerge to forage and end up with severe abrasions into the flippers and may eventually lose an entire flipper if entanglement persists (E. Phillips pers obs.) The potential for entanglement while laying the cable is relatively low. This is especially true for the deep-diving Leatherback sea turtle, which can reach depths up to 1,000 m. By actively observing for turtles in the area and moving at a slow speed (3-5 knots), the potential interactions may be reduced.

Sea turtles must come to the surface to breathe, making vessel collision at the surface a possibility. After a deep dive turtles can be observed resting or "logging" at or just below the surface, often unaware of surrounding boat activity. Stranding data from other parts of the U.S. have shown that boat strikes can be an important source of mortality for sea turtles (Lutz and Musick 1997). This is especially true for boats moving at high speeds and with the propeller engaged (PSTRT 1998). The potential for collision with an individual sea turtle during cable-laying operations exists, but can be minimized by maintaining a slow speed (3-5 knots). In this case, the vessel's presence and noise will be useful in alerting the turtle to the vessel's approach. By ensuring that the cable-laying vessel and any support vessels maintain a slow speed (less than 3-5 knots), potential ship strikes will be minimized. The vessel's noise and presence may alter foraging efforts slightly, but will probably aid in reducing impacts.

Leatherback sea turtles are protected under the Endangered Species Act and listed as a Federal and State (CA) Endangered species, while Green and Olive Ridley sea turtles are listed as Threatened species federally and Endangered species by California (NDDB 1999, USFWS 2004). Any interaction or disturbance (e.g. direct contact) to an individual sea turtle should be reported.

SUMMARY

The proposed installation of a buried cable from Moss Landing to 900 m depth outside Monterey Bay could affect seabirds and sea turtles by entanglement, vessel collisions, physical disturbance due to the presence of vessels, and acoustic disturbance. Because of the diversity, density, and protected status of many species in the vicinity of Monterey Bay, there is concern for potential impacts of cable-laying activities. There is minimal chance that cable laying will cause entanglement or collisions, however, the presence of the vessel will cause some minor amounts of physical and acoustical disturbance. We suggest that cable-laying occur during May or June, or early summer, when there are generally fewer seabirds and sea turtles. To minimize the likelihood of collisions, we suggest a reduced speed (3-5 knots) when traveling nearshore, and operating during daylight hours. To reduce collisions with seabirds during night, we suggest operating with minimal deck lighting and shielding to achieve downward-radiating light. Significant impacts to birds (> 5 mortalities), endangered species (e.g. brown pelican interactions), and all interactions with sea turtles should be reported. Probably the most effective method of minimizing impacts would be to complete the cable installation as rapidly as possible. Therefore, any means to reduce impediments to the rapid completion of this project should be encouraged.

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Table 1. Expected seasonal occurences of seabird and sea turtle species along cable-laying path of the MBARI MARS project. White = present but not abundant, Grey = moderately abundant, and black = abundant; S-1 is the first 18 km of the cable, S-2 is 18-36 km of the cable, and S-3 is the last 13.5 km of the cable. FE=Federal End, SE=State End, FT=Federal Threat, CSC=CA Special Concern species, FSC=Federal Special Concern species, MNBMC=Migr. Nongame Bird of Manage. Concern. Based on Roberson (2002), Benson (unpub. data), NDDB website (1999).

SEABIRDS			Dec-Mar			Apr-Jul			Aug-Nov		
COMMON NAME	**SPECIES NAME**	**STATUS**	S-1	S-2	S-3	S-1	S-2	S-3	S-1	S-2	S-3
Common loon	*Gavia immer*	CSC, MNBMC									
Red throated loon	*Gavia stellata*										
Pacific loon	*Gavia pacifica*										
Yellow-billed loon	*Gavia adamsii*										
Western grebe	*Aechomophorus occidentalis*										
Clark's grebe	*Aechomophorus clarkii*										
Pied-billed grebe	*Podilymbus podiceps*										
Red-necked grebe	*Podiceps grisegena*										
Horned grebe	*Podiceps auritus*										
Eared grebe	*Podiceps nigricollis*										
Black-footed albatross	*Phoebastria nigripes*										
Laysan albatross	*Phoebastria immutabilis*										
Short-tailed albatross	*Phoebastria albatrus*	FE, SE									
Northern fulmar	*Fulmarus glacialis*										
Sooty shearwater	*Puffinus griseus*										
Buller's shearwater	*Puffinus bulleri*										
Pink-footed shearwater	*Puffinus creatopus*										
Short-tailed shearwater	*Puffinus tenuirostris*										
Black-vented shearwater	*Puffinus opisthomelas*										
Ashy storm-petrel	*Oceanodroma homochroa*	CSC, MNBMC									
Black storm-petrel	*Oceanodroma melania*	CSC									
Fork-tailed storm-petrel	*Oceanodroma furcata*	CSC									
Leach's storm-petrel	*Oceanodroma leucorhoa*										
California brown pelican	*Pelecanus occidentalis*	FE, SE, MNBMC									
American white pelican	*Pelecanus erythrorhynchos*	CSC									
Double-crested cormorant	*Phalacrocorax auritus*	CSC									
Brandt's cormorant	*Phalacrocorax penicillatus*										
Pelagic cormorant	*Phalacrocorax pelagicus*										
Surf scoter	*Melanitta perspicillata*										
White-winged scoter	*Melanitta fusca*										
Black scoter	*Melanitta nigra*										
Red-necked phalarope	*Phalaropus lobatus*										
Red phalarope	*Phalaropus fulicaria*										
Parasitic jaeger	*Stercorarius parasiticus*										
Pomarine jaeger	*Stercorarius pomarinus*										
Heermann's gull	*Larus heermanni*										
Bonaparte's gull	*Larus philadelphia*										
Ring-billed gull	*Larus delawarensis*										
California gull	*Larus californicus*	CSC									
Western gull	*Larus occidentalis*										
Glaucous-winged gull	*Larus glaucescens*										
Mew gull	*Larus canus*										
Laughing gull	*Larus atricilla*	CSC									
Black-legged kittiwake	*Rissa tridactyla*										
Black skimmer	*Rynchops niger*	CSC									
Black tern	*Chlidonias niger*	FSC, CSC, MNBMC									
California least tern	*Sterna antillarum*	FE, SE, MNBMC									
Caspian tern	*Sterna caspia*										
Elegant tern	*Sterna elegans*	FSC, CSC, MNBMC									
Forster's tern	*Sterna forsteri*										
Common murre	*Uria aalge*										
Tufted puffin	*Fratercula cirrhata*	CSC									
Rhinocerous auklet	*Cerorhinca monocerata*	CSC									
Pigeon guillemot	*Cepphus columba*										
Xantus' murrelet	*Synthliboramphus hypoleucus*	MNBMC									
Marbled murrelet	*Brachyramphus marmoratus*	FT, SE, MNBMC									
Cassin's auklet	*Ptychoramphus aleuticus*										
Horned puffin	*Fratercula corniculata*										
Ancient murrelet	*Synthliboramphus antiquus*										

SEA TURTLES			Dec-Mar			Apr-Jul			Aug-Nov		
COMMON NAME	**SPECIES NAME**	**STATUS**	S-1	S-2	S-3	S-1	S-2	S-3	S-1	S-2	S-3
Leatherback sea turtle	*Dermochelys coriacea*	FE, SE									
Olive ridley sea turtle	*Lepidochelys olivacea*	FT, SE									
Green sea turtle	*Chelonia mydas*	FT, SE									

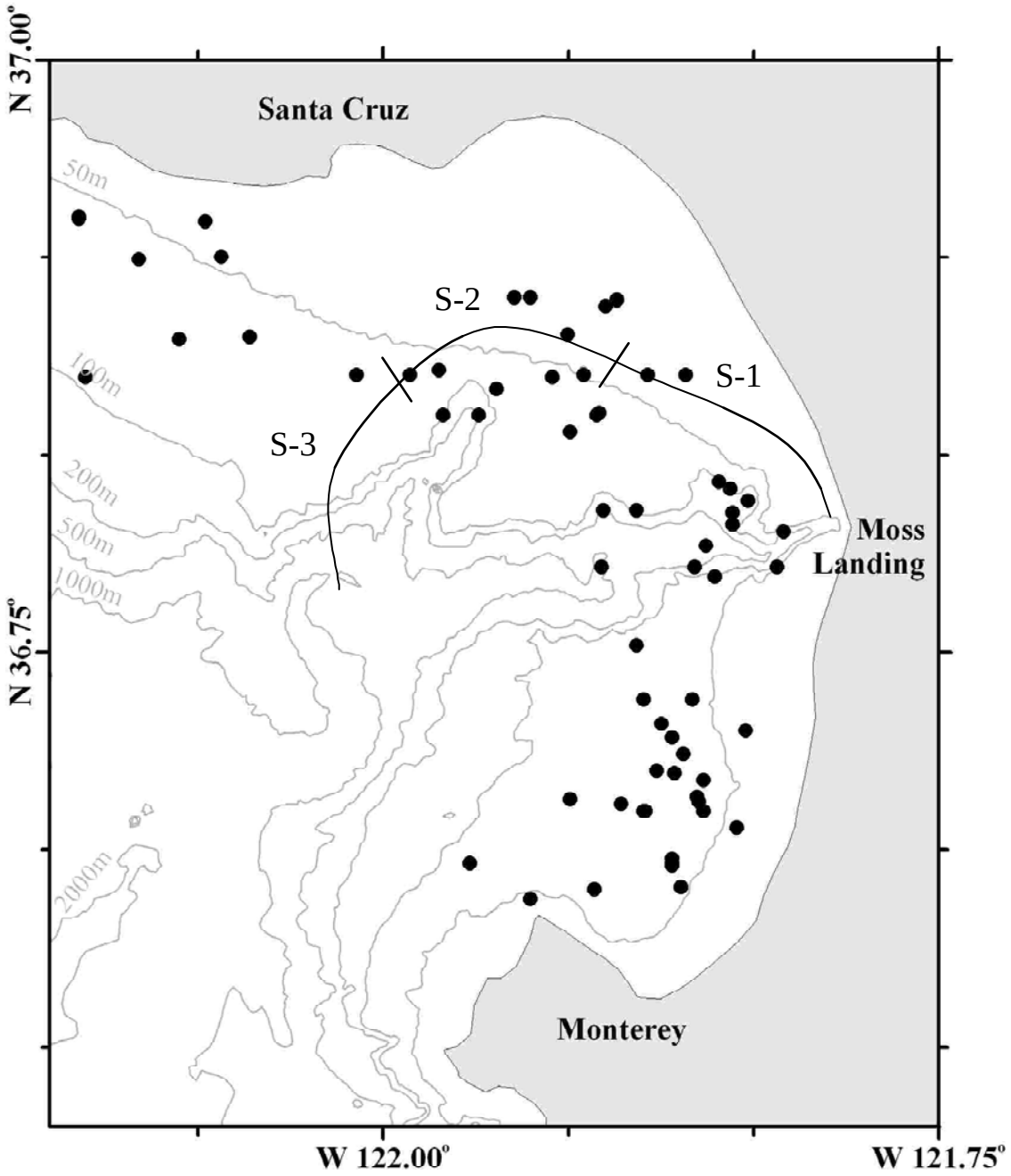

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Figure 1. Location of proposed cable by MBARI, with sections (S-1, S-2, and S-3) used in discussion of potential impacts to sea birds and turtles.